~~ELECTRONIC PHOTOGRAPHING DEVICE~~

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an electronic photographing device ~~being~~ capable of panorama photographing.

2. Related Art Statement

Conventionally, a photographing device ~~being~~ capable of recording information image corresponding to a ~~panorama~~ panoramic image photographed by a photographing means on a recording medium. However, in the conventional camera, ~~panorama~~ panoramic photographing is performed regardless of the capacity of the recording medium. For this reason, the following disadvantage occurs. That is, the capacity of the recording medium ~~becomes short~~ runs out in the middle of ~~panorama~~ panoramic photographing session to make ~~photographing~~ impossible to finish the photographing session.

Even if ~~panorama~~ panoramic photographing is performed after a recording medium is exchanged, identification data for identifying one set of ~~panorama~~ panoramic images recorded on the recording medium before the recording medium is exchanged is not ~~uniformed~~. For this reason, an editing operation after photographing is cumbersome, and an exposure level of a photographing means and the distance information of a photographing lens are different from those obtained

before the recording medium is exchanged, so that accurate ~~appropriate~~ panoramic ~~panorama~~ photographing cannot be performed. ~~disadvantageously.~~

OBJECTS AND SUMMARY OF THE INVENTION

The present ~~It is a first object of the~~ invention ~~to~~ provides ~~provide~~ an electronic photographing device which avoids the inconvenience of having ~~that~~ a photographing session ~~cannot be~~ unexpectedly stopped ~~performed~~ due to insufficient ~~because the~~ capacity of a recording medium ~~becomes short~~ in the middle of a panoramic ~~panorama~~ photographing session.

The present ~~It is a second object of the~~ invention also ~~to~~ provides an electronic photographing device in which, when image information corresponding to a panoramic ~~panorama~~ image photographed by a photographing means is subsequently recorded on a spare recording medium, photographing is performed under the same conditions such as an appropriate exposure and appropriate focal point adjustment for the entire ~~one~~ set of panoramic ~~panorama~~ images, and an editing operation for one set of panorama images can be easily performed after the photographing.

In short, according to the invention, an electronic photographing device comprises:

a recording medium for recording image information corresponding to each frame photographed by panorama photographing;

a predictive number of panorama-photographed frames

setting device for setting information corresponding to the predicted ~~predictive~~ number of photographed frames to be photographed by panorama photographing;

a number of photographing-capable frames setting device for setting the number of frames which can be photographed on the basis of an available ~~a~~ capacity of the recording medium;

a comparison device for comparing the number of photographing-capable frames set by the number of photographing-capable frames setting device with the predictive number of photographed set by the predictive number of panorama-photographed frames setting device; and

a warning device for displaying ~~performing~~ warning ~~about~~ that a spare recording medium is required, as a result of comparison by the comparison device, if the number of photographing-capable frames set by the number of photographing-capable frames setting device is smaller than the predicted ~~predictive~~ number of photographed frames set by the predicted ~~predictive~~ number of panorama-photographed frames setting device.

This objects and advantages of the present invention will become further apparent from the following detailed explanation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view showing the appearance of an electronic photographing device according to the first and second preferred embodiments of the present invention.

FIG. 2 is a side view showing the appearance of the electronic photographing device according to the first and second preferred embodiments of the present invention.

FIG. 3 is a perspective view showing the appearance of the electronic photographing device according to the first and second preferred embodiments when viewed from the rear surface side of the electronic photographing device.

FIG. 4 is a view showing a state wherein the electronic photographing device according to the first and second preferred embodiments of the present invention is connected to a personal computer, a digital recorder, and a printer.

FIG. 5 is a block diagram showing an entire electric arrangement of the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 6 is a recording format of the image information corresponding to a one-frame image recorded on the recording medium of the electronic photographing device according to the first and second preferred embodiments of the present invention.

FIG. 7 is a flow chart showing the flow of the entire operation of the electronic photographing device according

to the first preferred embodiment of the present invention.

FIG. 8 is a flow chart showing an initial setting operation of a photographing mode in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 9 is a flow chart showing an operation of setting the number of panorama-photographed frames of one set (the predictive number of panorama-photographed frames) in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 10 is a flow chart showing the flow of photographing operations of the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 11 is a flow chart showing the flow of the entire operation of an editing mode serving as a sub-mode of a panorama mode in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 12 is a flow chart showing the flow of the entire operation of an erase mode serving as a sub-mode of the editing mode in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 13 is a flow chart showing the flow of the

entire operation of a protect mode serving as a sub-mode of the editing mode in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 14 is a flow chart showing the flow of the entire operation of a print mode serving as a sub-mode of the editing mode in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 15 is a view showing a display example of a liquid-crystal display unit when selection of the sub-mode of the panorama mode is performed in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 16A is a view showing a display example of a liquid-crystal display unit when selection of a ~~rotating~~ rotation direction of a camera in panorama photographing in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 16B is a view showing a display example of a liquid-crystal display unit when selection of a ~~rotating~~ rotation direction of a camera in panorama photographing is performed in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 16C is a view showing a display example of a

liquid-crystal display unit when selection of a ~~rotating~~ rotation direction of a camera in panorama photographing is performed in the electronic photographing device according to the first ~~embodiment~~ preferred embodiment of the present invention.

FIG. 17A is a view showing a display example of a liquid-crystal display unit when selection of a ~~rotating~~ rotation direction of a camera in panorama photographing is performed in the electronic photographing device according to the first ~~embodiment~~ preferred embodiment of the present invention.

FIG. 17B is a view showing a display example of a liquid-crystal display unit when selection of a ~~rotating~~ rotation direction of a camera in panorama photographing is performed in the electronic photographing device according to the first ~~embodiment~~ preferred embodiment of the present invention.

FIG. 17C is a view showing a display example of a liquid-crystal display unit when ~~selection of a rotating direction of~~ a camera is rotated in a selected direction in panorama photographing ~~is performed in~~ using the electronic photographing device according to the first ~~embodiment~~ preferred embodiment of the present invention.

FIG. 18 is a view showing a display example of a liquid-crystal display unit when selection of the number of photographed frames in panorama photographing is performed in the electronic photographing device according to the first ~~embodiment~~ preferred embodiment of the present invention.

FIG. 19 is a view showing a display example of a liquid-crystal display unit when selection of the sub-mode of the editing mode is performed in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 20A is a view showing a display example in which a multi-divided photographed image is displayed on the liquid-crystal display unit in the erase mode serving as a sub-mode of the editing mode in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 20B is a view showing a display example in which a multi-divided photographed image is displayed on the liquid-crystal display unit in the erase mode serving as a sub-mode of the editing mode in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 21A is a view showing an example in which only a panoramic ~~panorama~~ image is displayed at the central portion of the screen of the liquid-crystal display unit in the erase mode serving as a sub-mode of the editing mode in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 21B is a view showing an example in which only a panoramic ~~panorama~~ image is displayed at the central portion of the

screen of the liquid-crystal display unit in the erase mode serving as a sub-mode of the editing mode in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 22 is a view showing a display example of the liquid-crystal display unit when selection of a sub-mode of the protect mode serving as a sub-mode of the editing mode in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 23 is a view showing an example in which an image to be printed is selected by a circular flicker display in the print mode serving as a sub-mode of the editing mode in the electronic photographing device according to the first preferred embodiment of the present invention.

FIG. 24 is a block diagram showing an entire electric arrangement of the electronic photographing device according to the second preferred embodiment of the present invention.

FIG. 25 is a view showing an example in which a Rotation ~~rotating~~ direction of a camera is displayed on the liquid-crystal display unit in panorama photographing of the electronic photographing device according to the second preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the present invention will be described below with reference to the accompanying drawings.

A first preferred embodiment of the present invention will be described below.

The entire arrangement and operation of an electronic photographing device (to be referred to as a "camera" hereinafter) according to this embodiment will be described below.

FIGS. 1 to 3 are views showing the appearances of the camera, in which FIG. 1 is a front view, FIG. 2 is a side view, and FIG. 3 is a perspective view showing the camera when viewed from the rear surface.

FIG. 4 is a view showing a state wherein the camera is connected to a personal computer (to be referred to as a "PC" hereinafter) 44, a digital recorder 45, and a printer 46.

FIG. 5 is a block diagram showing the entire electric arrangement of the camera.

As shown in FIG. 1, a photographing lens 2 held by a lens mirror cylinder 3 is arranged toward the ~~on an almost~~ right side of the central portion on the front surface of a camera body 1 as shown in FIG. 1. An optical finder objective unit 4 is exposed to the upper side of the photographing

lens 2, and distance measurement lenses 5 and 6 are arranged on the left and right sides of the optical finder objective unit 4 to be spaced apart from each other by a predetermined base length. An electric-flash device 7 for illuminating an object is arranged on the left side of the distance measurement lens 5, and a grip portion 8 for holding the camera body 1 is arranged on the left side of the electric-flash device 7. A strap fixing portion 9 is arranged on the side surface of the grip portion 8.

On the side surface of the camera body 1 opposing the grip portion 8, as shown in FIG. 2, a recording medium insertion/extraction port 15 is provided for inserting/removing a recording medium 33 serving as a detachable recording means (to be described later) ~~which is detachably set. On the lower side of~~ Below the recording medium insertion/extraction port 15, a video output terminal 19 for connecting the camera to a monitor television and a data input/output terminal 20 for connecting the camera to an external machine such as a printer or a PC are formed.

Referring to FIG. 3, arranged on the upper surface of the camera body 1 are a release switch 10; an increment switch 11 for updating a set numeral value such as a date to increase the value; ~~contrary to this~~, a decrement switch 12 for updating a set numeral value or the like to decrease the value; a fixing switch 13 for fixing the data

such as a date selected by the increment switch 11 or the decrement switch 12; a mode selection switch 14 for selecting a predetermined mode from various modes of the camera; and a liquid-crystal display unit 16 for displaying mode information or the like selected by the mode selection switch 14 ~~are arranged~~. These various operation switches are automatic-reset switches.

Arranged on ~~On~~ the rear surface of the camera body 1, a liquid-crystal display unit 17 for displaying information which is required for a predetermined editing operation (to be described later) performed by the camera, such as a date selected by the increment switch 11 or the decrement switch 12 or a photographing date of an image ~~photographed image is arranged~~. A power supply switch 18 for supplying a power to the camera is arranged on the upper right portion on the rear surface of the camera body 1.

Referring to FIG. 4, the camera body 1 is connected to the PC 44 to execute, as needed, further various types of image processing which cannot be executed by the camera itself. The camera 1 is connected to the digital recorder 45 to record a large amount of image data from the recorded on the recording medium 33 onto ~~on~~ the digital recorder 45. The camera 1 is also connected to the printer 46 to cause the printer 46 to print the image corresponding to the image data recorded on the recording medium 33. The printer 46

is also connected to the PC 44 to ~~be able to print~~ enabling the printing of the image corresponding to the image data processed by the PC 44.

The electric arrangement of the camera according to this embodiment will be described below with reference to FIG. 5. The same reference numerals as in the arrangements described in FIGS. 1 to 3 denote the same parts in the arrangement described in FIG. 5.

The photographing lens 2 is arranged to form an object image on the photographing surface of a solid state imaging element 25 arranged behind the photographing lens 2. The photographing lens 2 is mechanically connected to a photographing lens drive unit 21. The photographing lens 2 is driven to a predetermined position such that a clear object image is always formed on the photographing surface of the solid state imaging element 25 on the basis of a distance to an object measured by a distance measurement circuit 34 (to be described later).

An aperture 22 arranged behind the photographing lens has an aperture function of adjusting a depth of field and an amount of exposure for the solid state imaging element 25 and a shutter function of determining a shutter speed. This aperture 22 is mechanically connected to an aperture drive unit 23. The aperture 22 is set to have a predetermined ~~numeral aperture~~ diameter and a predetermined shutter

speed on the basis of a command signal from a CPU (Center Processing Unit) 39.

An optical low-pass filter 24 for preventing reflected distortion from being generated in a video signal is arranged behind the aperture 22.

The solid state imaging element 25 is arranged behind the optical low-pass filter 24. A drive circuit 26 is connected to the solid state imaging element 25 to store a signal from the solid state imaging element for a predetermined period of time and generate a signal for reading the stored signal at a predetermined timing. The drive circuit 26 is connected to the CPU 39 to be controlled on the basis of a signal from the CPU 39.

The output terminal of the solid state imaging element 25 is connected to the input terminal of an A/D converter 27. An analog output signal from the solid state imaging element 25 is converted into a digital signal by the A/D converter 27, and the digital signal is sent to a Digital Signal Processor 28 connected to the output terminal of the A/D converter 27. The DSP 28 is a processor for dividing the digital signal into a color-difference signal and a luminance signal to perform correction and a compression/expansion process.

The output terminal of the digital signal processor 28 is connected to a Discrete Cosine Transform (to be

referred to as DCT hereinafter) circuit 29. In the DCT circuit 29, an orthogonal transformation which is an ~~one process of~~ image compression/expansion process~~es~~ in accordance with the JPEG is performed. The DCT circuit 29 is connected to a Huffman Encoder/Decoder 30. In this Huffman Encoder/Decoder 30, a predetermined process which is an ~~one process of~~ image compression process in accordance with the JPEG is performed. With the Huffman encoding/decoding process performed here, a high-~~efficient~~ efficiency image compression/expansion process can be performed.

The output terminal of the Huffman encoder/decoder circuit 30 is connected to a Memory Control Circuit 31. The output terminal of this memory control circuit 31 is connected to the recording medium 33 through a connector 32. The memory control circuit 31 ~~is~~ acts to record data on the recording medium 33 or read recorded data from the recording medium 33.

A distance measurement circuit 34 is a circuit for forming a signal for measuring a distance from the camera to an object. In this camera, ~~since the principle of triangular distance measurement,~~ the two distance measurement lenses 5 and 6 which are spaced apart from each other by a predetermined base length are arranged such that an object image is formed on a light-receiving surface of a distance measurement sensor (not shown)

serving as the main component of ~~constituting~~ the distance measurement circuit 34.

The CPU 39 executes a predetermined process on the basis of an output signal from the distance measurement circuit 34 to calculate a distance to the object. On the basis of the calculation result, the CPU 39 sends a predetermined signal to the photographing lens drive unit 21. With this arrangement, the photographing lens drive unit 21 drives the photographing lens 2 to a predetermined position such that a focused object image is always formed on the photographing surface of the solid state imaging element 25.

The electric-flash circuit 35 is connected to the CPU 39. The CPU 39 is a circuit which radiates auxiliary light on the object when determined to be necessary by ~~under the condition in which~~ the CPU 39 ~~determines,~~ on the basis of brightness ~~bright~~ information of the object measured by a photometric circuit 38 (to be described later), e.g., that the object has low brightness. ~~or other conditions.~~

A calendar signal generation means 36 is connected to the CPU 39 to generate a calendar signal on the basis of a date input by a camera operator, a photographing date data recorded on the recording medium 33, or the present date generated by a timer incorporated in the CPU 39. This calendar signal may be incorporated in the CPU 39.

The character signal generation circuit 37 is

connected to the CPU 39 to generate a character signal consisting of fonts such as letters, numbers, ~~and alphabets~~ which are required for ~~at least~~ a calendar. The character signal may be incorporated in the CPU 39.

The liquid-crystal display units 16 and 17 are connected to the CPU 39 to be controlled by the CPU 39. The video output terminal 19 and the data input/output terminal 20 are also connected to the CPU 39, and all the various operation switches are also connected to the CPU 39. The basic functions of the various operation switches have been described above in FIGS. 1 to 3.

The photometric circuit 38 is connected to the CPU 39. The photometric circuit 38 is a circuit to measure the brightness of the object prior to a photographing operation. The value of a shutter speed is determined on the basis of information obtained by a photometric operation by the photometric circuit 38, ~~and it is determined~~ whether auxiliary light is illuminated through the electric-flash circuit 35, as described above.

The CPU 39 is arranged to identify information input by an operator of the camera 1 and perform various controls of the entire camera depending on the identification information.

The operation of the first embodiment will be described below.

When the mode selection switch 14 arranged on the upper surface of the camera 1 is pressed, the mode is sequentially switched to various photographing modes or various process modes. This embodiment relates to a mode for performing panorama photographing (to be referred to as a "panorama mode" hereinafter) of these various modes.

This embodiment will be described below with reference to FIG. 6 showing a recording format of image information of each frame photographed and recorded on the recording medium 33, FIGS. 7 to 14 which are flow charts showing the flows of operations of this embodiment, and FIGS. 15 to 23 which are display examples of the liquid-crystal display unit 17 corresponding to the operations of this embodiment.

FIG. 7 is a main routine showing the entire flow of the operation of this embodiment.

The mode selection switch 14 is pressed to select a panorama mode while checking the liquid-crystal display unit 16. When the panorama mode is set, as shown in FIG. 15, a menu constituted by a "photographing" mode, an "editing" mode, and "end" serving as sub-modes are displayed at the upper right portion of the liquid-crystal display unit 17. Operation contents operated by a camera operator are displayed at the lower left portion of the liquid-crystal display unit 17.

A display "+-" represents that one sub-mode can be selected from the menu by operating the increment switch 11 or the decrement switch 12. The display at the upper left portion of the liquid-crystal display unit 17 is a display representing that the panorama mode is set.

When the increment switch 11 or the decrement switch 12 is operated, a triangle index on the left of the sub-modes moves. When the index moves to the position of a predetermined sub-mode, the fixing switch 13 is pressed, and the selection of the predetermined sub-mode is fixed. At the same time, a mark representing that the predetermined sub-mode ~~is~~ has been selected and fixed is displayed at the lower right portion of the liquid-crystal display unit 17. It is checked whether the selected sub-mode is the "photographing" mode. In the following description, for descriptive convenience, this determination process is called [J701].

As a result of this determination process [J701], if it is determined that the "photographing mode" is set, various processes for panorama photographing (to be ~~descried~~ described later) are executed. On the other hand, as a result of the determination process [J701], if it is determined the editing mode is set, a predetermined editing process such as an erase process is executed to a panorama image photographed in the "photographing" mode.

As a result of the determination result [J701], if the "photographing" mode is selected, a subroutine (to be referred to as "subroutine 1") for ~~predetermined~~ determining an initial setting is executed. The subroutine 1 will be described below with reference to FIG. 8.

In the subroutine 1, a ~~change~~ direction of a ~~rotating~~ rotation angle of the camera in the panorama photographing is set.

When the "photographing" mode is selected, a predetermined display as shown in FIG. 16A appears on the liquid-crystal display unit 17 to overlap the image of the object. Upper and lower rectangular marks and arrows in FIG. 16A represent that the camera is rotated such that the photographing surface of the solid state imaging element 25 corresponding to the position of the upper rectangular mark moves to the position where the object in the lower rectangular mark is photographed in the next photographing operation. More specifically, in this case, the camera is rotated from the upper side to the lower side.

When the increment switch 11 is pressed, as shown in FIG. 16B, the direction of the arrows is switched. In this case, according to the same theory as described above, the camera is rotated from the lower side to the upper side.

When the increment switch 11 is pressed, as shown in

FIG. 17A, rectangular marks and arrows are displayed on the left and right sides of the liquid-crystal display unit 17. In this case, according to the same theory as described above, the camera is rotated clockwise.

In addition, when the increment switch 11 is pressed, the direction of the arrows is switched as shown in FIG. 17B. In this case, according to the same theory as described above, the camera is rotated counterclockwise.

Although the display of the liquid-crystal display unit 17 is switched by pressing the increment switch 11 in the above description, the decrement switch 12 may be pressed. In this case, the display order is reversed.

When any one of the above displays representing the rotating directions of the camera appears on the liquid-crystal display unit 17 by pressing the increment switch 11 or the decrement switch 12, if the fixing switch 13 is pressed, the ~~rotating~~ rotation direction of the camera is fixed.

As shown in FIG. 6, information representing the ~~rotating~~ rotation direction of the camera is recorded on the recording medium 33 as header information in correspondence with each image.

Upon completion of setting of the rotating direction of the camera, the number of panorama-photographed frames of one set (the ~~predictive~~ predicted number of panorama-photographed

frames) is set. This setting will be described below with reference to subroutine 11 in FIG. 9.

In the subroutine 11, the number of ~~photographing-capable~~ available frames (n1) which can be recorded on the recording medium 33 is calculated. Selection is performed to check whether the ~~predictive~~ predicted number of photographed frames (N) is equal to or larger than the predetermined number of frames.

FIG. 18 shows an example in which two selection menus representing that the ~~predictive~~ predicted number of frames N is equal to or larger than the number of panorama-photographing-capable frames n1 (temporarily set as 10) and that the ~~predictive~~ predicted number of frames N is smaller than the number of ~~panorama-photographing-capable~~ unexposed frames n1 available for panoramic photographing are displayed on the upper right portion of the liquid-crystal display unit 17. As in the above operation, the triangle mark on the left side of the menus is moved by operating the increment switch 11 or the decrement switch 12.

The selected predictive number of frames to be panorama-photographed (N) is compared with the number of ~~panorama-photographing-capable~~ available frames (n1). Here, if N > n1, a ~~display representing~~ warning (not shown) of "require spare recording medium" is ~~made~~ displayed on the liquid-crystal display unit 17. ~~with warning (not shown).~~

When the fixing switch 13 is pressed, a menu indicated by the triangle mark is fixed.

FIG. 18 is a view showing a case wherein 10 or more is selected as the predicted ~~predictive~~ number of photographed frames. As described above, when a lack of capacity of the recording medium is predicted, the photographer is warned of the lack of capacity, so that the inconvenience of having the ~~that~~ photographing ~~is~~ unexpectedly stopped can be prevented.

As a result of the selection, it is checked whether N > n1 is satisfied. If N > n1 is satisfied, "1" is set in a flag ("FLG1" is set) serving as a predetermined memory in the CPU 39. On the other hand, in the above determination, if N > n1 is not satisfied, "0" is set in the FLG1. Here, FLG1 = 1 represents that a spare recording medium is required, and FLG1 = 0 represents no spare recording medium is required. Upon completion of the above flag, the control flow returns from the subroutine 11.

The number of photographed frames to be selected is not limited to the above example. Various ~~More various~~ numbers having smaller ~~small~~ intervals may be selected as the number of photographed frames.

When the flow returns from the subroutine 11, the flow returns to the subroutine 1 shown in FIG. 8, and the flow returns from the subroutine 1. When the flow returns

from the subroutine 1, returning to FIG. 7, the subroutine 2 representing the flow of photographing operation is executed.

The operations ~~of the operations~~ of the subroutine 2 will be described below with reference to FIG. 10.

It is checked whether the first frame is photographed in panoramic ~~panorama~~ photographing mode. For convenience in the following description, this determination process is called [J1001]. As the determination result, if it is determined that the first frame is photographed, it is checked whether the release switch 10 is pressed.

Here, this determination process is called [J1002]. If the release switch 10 is not pressed, the determination process [J1001] is performed again, and the above operation is repeated. As a result of the determination process [J1001], if the first frame is not photographed, i.e., if the second frame or a frame subsequent to the second frame is photographed, it is checked by the following manner whether the rotation ~~rotating~~ angle of the camera falls within an allowable range.

When the camera is rotated in the direction designated in FIG. 16A, the image of a rectangular region "B" in the image of the first frame is ideally rotated to be located at a position "A" in photographing of the second frame. A correlation operation for detecting the

degree of coincidence between both the images is performed between the image data of the region B in FIG. 16A recorded on the recording medium 33 after the releasing operation and the image data of the region A in FIG. 16A of image data which are photographed in real time at predetermined intervals of time and converted into a digital signal before the next release operation. As a result of the correlation operation, if the degree of coincidence falls within an allowable range, it is determined that the rotating angle of the camera is appropriate, and flickered "OK" is displayed on the liquid-crystal display unit 17 (not shown).

It is determined in the determination process [J1002] that the release switch 10 is pressed, it is checked again whether the first frame is panorama-photographed. This determination process is called [J1003]. If it is determined in the determination process that the first frame is panorama-photographed, distance measurement for measuring the distance from the camera to the object is performed to drive the photographing lens 2 to a predetermined position. A photometric operation for determining an aperture diameter and a shutter speed is performed. The photometric information is stored in an internal memory of the CPU 39. White balance information is also stored in the memory. Exposure is performed on

the bases of the photometric information.

If it is determined in the determination process [J1003] that the first frame is not photographed, the distance measurement and the photometric operation are not performed, but exposure is performed under the same conditions as those in photographing of the first frame. This is because photographing of the second frame or a frame subsequent to the second frame is performed on the basis of the same distance measurement information, photometric information, and white balance information as those of the first frame. In this manner, the images of frames obtained by panorama photographing are synthesized with each other, a panorama image having an exposure, a focusing state, and white balance which are similar to those of a panorama image obtained by performing panorama photographing once can be obtained.

Upon completion of the exposure, an analog output signal from the solid state imaging element 25 is converted into a digital signal by the A/D converter 27. The digital signal is subjected to various signal processing such as image compression by the digital signal processor 28, the DCT circuit 29, and the Huffman encoder/decoder 30. The image data subjected to the predetermined signal processing is recorded on the recording medium 33 under the control of the memory

control circuit 31.

As shown in FIG. 6, in correspondence with the image data of the respective frames, shared file names of frames constituting panorama images, panorama numbers serving as data added to panorama images in a photographing order, and frame numbers serving as data representing the photographing order of all images are recorded as header information. As the header information, in addition to the above information, a ~~rotating~~ rotation direction which is described above and represents a ~~rotating~~ rotation direction of the camera in panorama photographing, a photographing date, and a protect code (to be described later) are recorded.

Upon completion of photographing, the menus of the same sub-modes as shown in FIG. 15 are displayed at the upper right portion of the liquid-crystal display unit 17, and selection is performed to check whether panorama photographing continues. As in the above selection of a sub-mode, a predetermined sub-mode is selected from the menu by operating the increment switch 11 or the decrement switch 12, and the selected sub-mode is fixed by the fixing switch 13.

In this embodiment, as described above, the above selection for checking whether panorama photographing continues is performed ~~every panorama photographing of one frame~~ for each frame photographed in panoramic mode. However, the invention is not limited to this

embodiment. The following methods may be used. For example, an interrupt function is given to a predetermined switch during panorama photographing, and the panorama photographing is ended when the predetermined switch is pressed. In addition, the number of panorama-photographed frames is input in advance, the panorama photographing may continue until photographing of the frames corresponding to the input number of panorama-photographed frames is completed. In this manner, it is not necessary to check the selection ~~performed~~ each time photographing of one frame is ended. ~~for checking whether panorama photographing continues is not necessary.~~

It is checked whether the fixed sub-mode is a "photographing" mode. Here, this determination process is called [J1004].

If the "photographing" mode is selected in the determination process, it is checked whether the number of remaining frames which can be recorded on the recording medium 33 is smaller than the predetermined number of frames (n2). This determination process is called [J1005]. As a result of the determination process, if the number of remaining recordable frames is not smaller than n2, the flow branches off to the determination process [J1001] to repeat the above operations.

If it is determined in the determination process [J1004] that "end" is selected, the flow returns from the

subroutine 2 to end panoramic ~~panorama~~ photographing.

If the "photographing" mode is selected in the determination process [J1004], and if it is determined in the determination process [J1005] that the number of remaining frames which can be recorded on the recording medium 33 is smaller than n2, the determination results are displayed on the liquid-crystal display unit 17 with a warning (not shown). With this arrangement, a photographer can prepare for an exchange of recording media 33.

It is checked whether the number of remaining frames which can be recorded on the recording medium 33 is "0". This determination process is called [J1006]. If it is determined in the determination process that the number of remaining frames which can be recorded on the recording medium 33 is not "0", the flow branches off to the determination process [J1001] to repeat the operations described above.

If it is determined in the determination process [J1006] that the number of remaining frames which can be recorded on the recording medium 33 is "0", the determination result is displayed with a warning.

This warning display will be described below with reference to FIGS. 16C and 17C.

FIG. 16C shows a case wherein the rotation ~~rotating~~ direction

of the camera is set to be a direction in which the camera is rotated from the upper side to the lower side (FIG. 16A). FIG. 16 shows the following case. That is, when the capacity of the recording medium 33 becomes zero in the middle of panorama photographing of several frames, the rectangular mark and the arrow on the lower side of the screen are cleared and only the upper mark is displayed to warn a photographer that the capacity becomes zero. In this case, a panorama mark at the upper left portion of the screen, a mark "+-" at the lower left portion of the screen, and a mode display are cleared. This is because it is apparent that panorama photographing is performed, and such displays are not necessary.

FIG. 17C shows a case wherein the rotation ~~rotating~~ direction of the camera is set to be to the right (FIG. 17A). FIG. 17C shows the following state. That is, when the capacity of the recording medium 33 becomes zero in the middle of panorama photographing of several frames, the rectangular mark and the arrow on the right side of the screen are cleared and only the left mark is displayed to display that the capacity becomes zero. In this case, for the same reason as described above, a panorama mark at the upper left portion of the screen, a mark "+-" at the lower left portion of the screen, and a mode display are cleared.

As described above, when one of the rectangular marks is cleared, it is ~~sensuously~~ apparent that the capacity of the recording medium 33 becomes zero, and a panorama photographing device which can be used in human engineering can be provided.

When the warning display is made, then it is checked whether the FLG1 is "0". This determination process is called [J1007]. Although the FLG1 is described in the explanation of the subroutine 11 shown in FIG. 9, FLG1 = 1 represents that the number of panorama-photographed frames is so large that a spare recording medium is required as the recording medium 33, and FLG1 = 0 represents that the spare recording medium is not necessary.

If FLG1 = 1 is satisfied in the determination process [J1007], a display representing that recording media must be exchanged is made on the liquid-crystal display unit 17 with the warning (not shown).

If FLG1 = 1 is not satisfied in the determination process [J1007], the flow returns from the subroutine 2 to end panorama photographing of one set of frames. More specifically, in this case, the determination process [J1007] serves as an inhibition means for inhibiting panorama photographing when the number of remaining frames which can be recorded on the recording medium 33 is determined as "0" in the determination process [J1006].

When the photographer does not want to continue panorama photographing, if the number of remaining frames which can be recorded on the recording medium 33 is determined as "0", the panorama photographing is forcibly inhibited, so that redundant ~~waste~~ operations such as mode switching can be omitted.

It is checked whether the recording media 33 has been ~~are~~ exchanged. If it is determined that the recording media 33 has been ~~are~~ exchanged, the flow goes to the determination process [J1001] again to repeat the above operations. Predetermined identification codes ~~respectively~~ recorded on each recording media 33 are checked to determine ~~check~~ whether the recording media 33 has been ~~are~~ exchanged. Here, when the recording media 33 is ~~are~~ exchanged, the same file names used ~~as~~ in the panorama photographing before the exchange, and the panoramic series ~~series panorama~~ numbers are added to the image data of the frames of the next panorama photographing session. In this manner, searching and editing operations for one set of panoramic ~~panorama~~ images after photographing can be easily performed.

If FLG1 = 1 is not satisfied in the determination process [J1007], the flow returns from the subroutine 2. When the flow returns from the subroutine 2, the flow returns to the main routine in FIG. 7 to end the panorama mode.

Here, the recording medium 33 before the exchange is used as a first recording medium, and the recording medium 33 after the exchange is used as a second recording medium. In this manner, the recording medium control circuit 31 and the CPU 39 connected to the recording media 33 through the connector 32 serve as recording medium control means which controls the first recording medium for recording image information corresponding to an image photographed by ~~panorama~~ panoramic photographing and also controls, in place of the first recording medium, the second recording medium for recording image information having a predetermined relativity to the image information recorded on the first recording medium when the capacity of the first recording medium is ~~short~~ insufficient.

The editing mode will be described below.

If it is determined in the determination process [J701] in FIG. 7 that the "photographing" mode is not set, then it is checked whether the "editing" mode is set. This determination process is called [J702]. As a result of the determination process, if it is determined that the "editing" mode is set, the flow branches off to subroutine (subroutine 3) ~~for performing~~ to perform editing.

The operation of the subroutine 3 will be described below with reference to FIGS. 11 to 14.

In the subroutine 3 shown in FIG. 11, as shown in

FIG. 19, menus "erase", "protect", "download", "print", and "end" which are sub-modes of the "editing" mode which are sequentially ordered from the upper side are displayed at the upper right portion of the liquid-crystal display unit 17. The "erase" is a mode for erasing ~~predetermined~~ stored image data.

The "protect" is a mode ~~for writing information~~ for inhibiting the ~~predetermined~~ stored image data from being ~~written~~ erased ~~and~~ or read. The "download" is a mode for storing image information ~~stored in~~ from the recording medium 33 in an external memory device such as the digital recorder 45. The "print" is a mode for printing the image corresponding to the image data recorded on the recording medium 33. The "end" is a mode for ending an editing operation to cause the flow to return to the main routine.

As in the above sub-mode selection, the increment switch 11 or the decrement switch 12 is operated to select a predetermined sub-mode from the sub-modes. After the predetermined sub-mode is selected, when the fixing switch 13 is pressed, the sub-mode is fixed.

It is checked whether the fixed sub-mode is the "erase" mode. This determination process is called [J301]. As a result of the determination process, if the "erase" mode is set, subroutine (subroutine 31) in this mode is executed.

The operation of the subroutine 31 will be described below with reference to the flow chart in FIG. 12.

When the "erase" mode is selected, as shown in FIG. 20A, the multi-divided image corresponding to image data recorded on the recording medium 33 is displayed on the liquid-crystal display unit 17. In FIG. 20A, the same letters ~~alphabets~~ denote one set of panorama images. The screen is divided into nine (3x3) small screens, and the small screens are sequentially ~~repeatedly~~ displayed ~~such that,~~ in a photographing order such that the three screens of the uppermost horizontal row of the entire screen are arranged from the left, and the three screens of the second horizontal row of the entire screen are arranged from the left. The arrangement of the small screens is called a screen sequential arrangement.

Selection of the erased screen is performed. On one of the multi-divided small screens, a circular point is flickered as shown in FIG. 20A. This flickered display represents the screen corresponding to image data to be erased. When the increment switch 11 is pressed, the flickered display moves horizontally in units of small screens. In a state wherein the flickered display is located in the small screen on the right end, when the increment switch 11 is pressed, the flickered display moves to the small screen on the left end of the next row.

The same operations as described above are repeated. When the decrement switch 12, the flickered display moves in the direction ~~opposing~~ opposite to the direction when the increment switch 11 is pressed.

The increment switch 11 is pressed, and, as shown in FIG. 20A, the flickered display is located in the small display on the right end of the lowermost row. In this case, when the increment switch 11 is pressed, as shown in FIG. 20B, the small screen shifts in the right direction. In this manner, even if ~~an image~~ all the images cannot be displayed on the screen at once, the entire image collection recorded on the recording medium can be easily confirmed.

When a protect code (see FIG. 6) is added to the image data corresponding to ~~the~~ a small screen selected as described above, the protect code is displayed with a warning ~~as a~~ code representing an inhibition of erasing (not shown). In this case, if the small screen corresponding to ~~the~~ protected image data is selected to be erased ~~is selected~~, the fixing switch 13 is invalid, and the image data is forcibly inhibited from being erased.

When the screen corresponding to image data to which a protect code is not added is selected, and the image corresponding to the fixed screen partially constitutes a ~~panorama~~ panoramic image, ~~warning about~~ a warning that the image partially constitutes a ~~panorama~~ panoramic image is ~~made~~ displayed (not shown). The

check whether the image partially constitutes a ~~panorama~~ image is made by ~~identify panorama~~ numbers (shown in FIG. 6) serving as data added to ~~panorama~~ images in ~~the~~ photographing order. The warning is ~~made~~ when the image is a ~~one~~ frame partially constituting a ~~panorama~~ image because the ~~panorama~~ image has higher relativity to another frame than that of a single image.

When the fixing switch 13 is pressed, the image corresponding to the selected small screen is erased. If the fixing switch is not pressed, the operations following the selection on the erased screen are repeated.

When the fixing switch 13 is pressed to erase the image data corresponding to the selected small screen, if the erased image data ~~is data~~ partially ~~constituting~~ a ~~panorama~~ image, ~~of~~ header information added to the image data shown in FIG. 6, the file name, panorama number, and frame number of ~~one~~ separated ~~panorama~~ image are updated.

When the number of frames constituting a ~~panorama~~ image separated by erasing the image data is only one, the image is not a panorama image. The panorama number is updated to a code corresponding to an ordinarily photographed frame. In this manner, a ~~panorama~~ image can be prevented from being erroneously recognized.

Upon completion of the above operation, the flow returns from the memory control circuit 31, and, in

FIG. 11, returning to the selection of the sub-mode in the "editing" mode, the same operations as described above are repeated.

In the explanation of the "erase" mode, a display having a screen sequential arrangement is used as a multi-divided display. However, the display is not limited to the display having a ~~the~~ screen sequential arrangement. More specifically, when the image ~~image~~ corresponding to image data recorded on the recording medium 33 is a panoramic ~~panorama~~ image, if the panoramic ~~panorama~~ image is horizontally rotated to be photographed, the panoramic ~~panorama~~ image is horizontally displayed at the center of the screen as shown in FIG. 21A. The direction and order of the arrangement of images constituting the panoramic ~~panorama~~ image are determined on the basis of the panorama number and the rotation ~~rotating~~ direction which are contained in the header information as shown in FIG. 6.

FIG. 21B shows a state in which the panorama image is shifted to the right by one frame by pressing the increment switch 11. When the display is made as described above, the same image as an object actually photographed is displayed. For this reason, a checking operation and an editing operation for the photographed panoramic ~~panorama~~ image can be easily performed advantageously.

In the above description, ~~the case wherein in~~

~~addition to the panorama image,~~ ordinarily photographed images are displayed at the same time with the panoramic image ~~once is explained~~. The present invention is not limited to the above description, however. For example, ~~and~~ only the ~~panorama~~ panoramic image may be selectively displayed.

In the subroutine 3 representing the operations in the "editing" mode, if it is determined in the determination process [J301] that the "erase" mode is not set, then it is checked whether the "protect" mode is set. This determination process is called [J302]. As a result of the determination process, if the "protect" mode is set, subroutine (subroutine 32) in this mode is executed.

This protect mode will be described below with reference to the flow chart shown in FIG. 13. In the subroutine 32 shown in FIG. 13, selection of a sub-modes is performed. The sub-modes are constituted by "setting" representing the setting of the protect mode, "cancel" representing the cancelling ~~cancel~~ of the protect mode, and "end" representing the end of the sub-mode selection ~~setting/cancel~~ of the protect mode. The selection of the sub-mode is performed by the same manner ~~as~~ described above with respect to ~~in~~ the explanations of other ~~the several~~ operations such that one of the menus displayed at the upper right portion of the liquid-crystal display unit 17 is selected as shown in FIG. 22.

In the selection of the sub-menu, if "setting" or "cancel" is selected, then setting of a protect code or

selection of an image in which a protect code is to be canceled is performed. This image selection is performed by displaying the image photographed by the liquid-crystal display unit 17 in a multi-division state in the same manner as that of the selection of an erased screen. In this case, unlike the selecting operation of the erased screen, when an image subjected to setting or ~~cancel~~ cancelling of the protect code is to be selected, it is checked whether a protect code is added to the selected image or whether the selected image ~~is~~ has previously been included in one set of panorama images, but ~~warning~~ is not yet ~~performed~~ protected.

Upon completion of the selection of the image subject to the setting or ~~cancel~~ cancelling of the protect code, it is checked whether the selected image is an image included in ~~one~~ a set of ~~panorama~~ panoramic images. This determination process is called [J3201]. As a result of the determination process, if it is determined that the selected image is one image included in ~~one~~ a set of ~~panorama image~~ panoramic images, then it is checked whether the protect code is set. This determination process is called [J3202].

As a result of the determination process, if it is determined that setting of the protect code is performed, the protect codes are set to all of ~~one~~ the images of the set of ~~panorama~~ panoramic images as the header information of the image data as shown in FIG. 6.

As described above, protect ~~modes~~ codes are added to all of the ~~panorama~~ panoramic images in the set when it is determined that the selected image is an image ~~of one~~ within a set of ~~panorama~~ panoramic images because the ~~panorama~~ panoramic images are usually processed as a whole ~~at high probability~~. As a matter of course, the invention is not limited to the above description. For example, a protect code may be ~~singly~~ individually added to ~~even an~~ a single image included in ~~the panorama~~ a set of panoramic images.

As a result of the determination process [J3202], if it is determined that setting of the protect code is not performed, i.e., if it is determined that ~~cancel~~ a cancellation of the protect code is to be performed, the protect codes of all of ~~one of~~ the ~~panorama~~ panoramic images in the set are canceled. Upon completion of the above operation, the flow shifts to the selection of a sub-mode again to repeat the above operations.

If it is determined in the determination process [J3201] that the selected image is not an image ~~of one~~ belonging to a set of ~~panorama~~ panoramic images, i.e., if it is determined that the selected image is an image photographed by ordinary photographing, then it is checked whether setting of a protect code is performed. This determination process is called [J3203]. As a result of the determination process, if it is determined that setting of a protect code is performed, a protect code is set ~~to~~ for the selected image.

As a result of the determination process [J3203], if a

setting of the protect code is not performed, i.e., if the protect code is canceled, the protect code of the selected image is canceled. Upon completion of the above operations, the flow shifts to the selection of a sub-mode again to repeat the above operations.

If "end" is selected in the selection of a sub-mode, the flow returns from the subroutine 32.

As shown in FIG. 11, if it is determined in the determination process [J302] that the "protect" mode is not set, then it is checked whether a "download" mode is set. This determination process is ~~called~~ called [J303]. As a result of the determination process, if it is determined that the "download" mode is set, image information recorded on the recording medium 33 is stored in the digital recorder 45 serving as an external memory device. Upon completion of the above operations, the flow shifts to the selection of a sub-mode again to repeat the above operations.

If it is determined in the determination process [J303] that the "download" mode is not set, then it is checked whether a "print" mode is set. This determination process is called [J304]. As a result of the determination process, if it is determined that the "print" mode is set, subroutine (subroutine 33) in this mode is executed. The subroutine 33 will be described

below with reference to FIG. 14.

When the flow branches off to the subroutine 33, a print image is selected. As in the "erase" mode, a photographed image is displayed in a multi-division state. As in the selection of an erased image in the "erase" mode, a print image to be printed is selected.

FIG. 23 shows a case wherein an image A2 serving as one frame of ~~panorama~~ images is selected. Here, if the selected image is the image of one frame of a ~~panorama~~ image, ~~it is displayed~~ that the selected image is one frame of ~~the panorama~~ image. In an example in FIG. 23, for this purpose, a panorama mark at the upper left of the screen is flickered.

It is checked whether the fixing switch 13 is pressed. If the fixing switch 13 is not pressed, the operation for selecting the print image is repeated. On the other hand, if the fixing switch 13 is pressed, then it is checked again whether the image is the image of one frame of the panorama image. This determination process is called [J3301]. Here, if the selected image is the image of one frame constituting the ~~panorama~~ image, after all of ~~one of panorama~~ images to which the frame belongs are printed, the flow returns from the ~~recording medium~~ 33.

As a result of the determination process [J3301], if

it is determined that the selected image is not an ~~the~~ image ~~of one frame of the panorama image~~ from a set of panoramic images, after the image of the ~~one~~ selected frame is printed, the flow returns from the subroutine 33.

As described above, a predetermined image selected by the camera is printed on the basis of a command signal output from the camera. For this reason, the system can be reduced in size and cost.

As shown in FIG. 11, it is determined in the determination process [J304] that the "print" mode is not set, it is understood that "end" is set, and the flow returns from the subroutine 3.

When the flow returns from the subroutine 3, in FIG. 7, the flow shifts to the selection of a sub-mode again to repeat the above operations.

In the determination process [J702], if it is determined that the "editing mode" is not set, it is understood that "end" is set, and all executions of the panorama mode are ended.

The second preferred embodiment of the present invention will be described below. In the following description, only arrangements and operations which are different from those of the first embodiment of the present invention will be explained.

In the first embodiment, when data corresponding to a

rotation direction of the camera when panoramic photographing is performed is to be recorded on the recording medium 33 as header information for each photographed image, the rotation direction of the camera is manually selected. However, in the second embodiment, as a means for setting information corresponding to the rotation direction of the camera, a means for automatically setting the information on the basis of an output signal from an angular velocity sensor for detecting the rotation angle and rotation direction of the camera body 1 is used.

The appearances of a camera serving as an electronic photographing device according to the second embodiment are the same as those in FIGS. 1 to 3. A view showing a connection state between the camera and a PC 44 in the second embodiment is the same as that shown in FIG. 4.

FIG. 24 is a block diagram showing the entire electric arrangement of the camera according to the second embodiment. The arrangement and operation of the camera will be described below.

The output terminal of an angular velocity sensor 40 is connected to the input terminal of an A/D converter 42. The output terminal of the A/D converter 42 is connected to a CPU 39.

The angular velocity sensor 40 detects an

angular velocity obtained when the camera is rotated about a Y-axis ~~an X-axis direction~~ which is a left-right direction when the camera is viewed from an object. An analog signal representing the angular velocity detected by the angular velocity sensor 40 is converted into a digital signal at a predetermined interval of time by the A/D converter 42, and the converted digital signal is subjected to time quadrature by the CPU 39. The digital signal subjected to time quadrature corresponds to an amount of rotation of the camera body 1 about the ~~X~~ Y axis. The ~~rotating~~ rotation direction is determined by checking the polarity of the analog output signal from the angular velocity sensor 40.

The output terminal of the digital recorder 41 is connected to the input terminal of an A/D converter 43. The output terminal of the A/D converter 43 is connected to the CPU 39.

When the upper-lower direction of the camera is set to be ~~a Y~~ an X-axis direction, the digital recorder 41 is to detect an angular velocity obtained when the camera is rotated about the ~~Y~~ X-axis ~~direction~~. An analog signal representing the angular velocity detected by the angular velocity sensor 41 is converted into a digital signal at a predetermined interval of time by the A/D converter 43, and the converted digital signal is subjected to time quadrature by the CPU 39. The digital signal subjected to

time quadrature corresponds to an amount of rotation of the camera body 1 about the ~~Y~~ X axis. The ~~rotating~~ rotation direction is determined by checking the polarity of the analog output signal from the angular velocity sensor 41.

The operation of the camera according to the second embodiment will be described below.

As described above, the second embodiment is different from the first embodiment ~~in~~ only in the ~~a~~ means for recording information related to the ~~rotating~~ rotation direction of the camera in the "photographing" mode on the recording medium 33. Therefore, only the different portion will be explained below in a description of the operations of the second embodiment.

In the second embodiment, in the subroutine 1 shown in FIG. 8, ~~any~~ an operation for manually setting a direction ~~in which~~ of the ~~rotating~~ rotation angle of the camera ~~is changed~~ is not required. In the subroutine 1, upon completion of execution of the subroutine 11 for setting the number of panorama-photographed frames, the subroutine 2 shown in FIG. 10 is executed.

In the subroutine 2 shown in FIG. 10, as in the first embodiment, it is checked whether the first frame is photographed in ~~panorama photographing~~ panoramic mode. This determination process is called [J1001].

As a result of the determination process, ~~if~~ it is

checked whether the release switch 10 is pressed. Here, the determination process is called [J1002].

If the release switch 10 is pressed, as in the first embodiment, predetermined photographing operations such as a photometric operation and an exposure operation are performed. However, in the second embodiment, in addition to the operations performed in the first embodiment, the time quadrature is executed on the corrected output signals of ~~to~~ the angular velocity sensors 40 and 41 immediately after the exposure operation. On the basis of the time quadrature, the ~~rotating~~ rotation angle and ~~rotating~~ rotation direction of the camera after photographing (exposure) of the first frame are calculated.

As a result of the determination process [J1001], if it is determined that the first frame is photographed, i.e., if the second frame or a frame subsequent to the second frame is photographed, the ~~rotating~~ rotation angle of the camera after the photographing (exposure) operation performed immediately before the photographing of the second frame or a frame subsequent to the second frame falls within an allowable range. More specifically, the rotating angle of the camera is ~~determined on the basis of the rotating angle of the camera~~ calculated on the basis of the result obtained by performing time quadrature to the output signal from the angular velocity sensors 40 and

41, and of information such as a focal length of the photographing lens 2.

At the same time, the rotation ~~rotating~~ direction is recorded as header information as shown in FIG. 6. While the camera is rotated, an arrow indicating the rotating direction of the camera is flickered and displayed at the lower right portion of a liquid-crystal display unit.

FIG. 25 shows an example wherein the camera is rotated clockwise. As a result of checking whether the rotation ~~rotating~~ angle of the camera falls within an allowable range, if it is determined that the rotating angle of the camera falls within the allowable range, "OK" is flickered and displayed on the liquid-crystal display unit 17 (not shown). When this flickered display is confirmed, a release operation is performed again, and the next frame is panorama-photographed in the same manner as described above.

In the second embodiment, whether the rotation ~~rotating~~ angle of the camera falls within the allowable range is checked by directly calculating the rotating angle on the basis of the time quadrature of the output signals from the angular velocity sensors 40 and 41. However, the present invention is not limited to this method, and, as in the first embodiment, the rotation ~~rotating~~ angle may be calculated by performing a correlation operation between the image data

of photographed frames after and before the exposure operation.

In the second embodiment, an angular velocity sensor is ~~used~~ disclosed the as ~~a~~ sensor for detecting the ~~rotating~~ rotation direction and ~~rotating~~ rotation angle of the camera. ~~For example~~, Alternatively as the sensor, not only the angular velocity sensor, but also an acceleration sensor may be used.

The angular velocity sensor used in the second embodiment and a sensor for detecting preventing blurring of the camera ~~to prevent the camera from blurring are~~ may also be used, so that a cost/performance ratio may be increased.

According to the second embodiment of the present invention described above, information related to a ~~rotating~~ rotation direction of ~~panorama~~ panoramic photographing can be recorded on the recording medium 33 with a simple operation. In addition, since the ~~rotating~~ rotation angle of the camera can be correctly ~~known.~~ determined, everybody can easily perform ~~panorama~~ panoramic photographing with a simple operation.

In each of the first and second embodiments, when the data corresponding to the ~~rotating~~ rotation direction of the camera in ~~panorama~~ panoramic photographing is to be recorded on the recording medium 33 as header information for each photographed image, information related to the ~~rotating~~ rotation direction is manually set or automatically determined an angular velocity sensor. The ~~rotating~~ rotation direction is not limited to

the ~~above-described~~ directions described above, as ~~direction, and~~ the rotating direction may be set to be a predetermined direction, e.g., a closing direction of a tripod screw for fixing the camera.

According to the embodiments of the present invention, photographing is prevented from being unexpectedly stopped ~~by~~ due to a lack of capacity of the recording medium during a panoramic ~~in the middle of panorama~~ photographing session. When image information corresponding to a ~~panorama~~ panoramic image photographed by the photographing means is sequentially stored in a spare recording medium, photographing is performed under the conditions such as an appropriate exposure and appropriate focal point adjustment for ~~one~~ the set of panorama images, and an editing operation for ~~one~~ the set of panorama images can be easily performed after the photographing.

In this invention, it is apparent that various embodiments working ~~modes different in a wide range~~ can be formed on this basis of this ~~invention~~ disclosure without departing from the spirit and scope of the invention. This invention is not restricted by any specific embodiment expect being limited by the appended claims.